STEERING SYSTEM - POWER RECIRCULATING BALL

1996 STEERING Power Recirculating Ball - General Motors Corp.

DESCRIPTION & OPERATION

Steering gear is a variable ratio, recirculating ball-type which acts as a rolling thread between worm shaft and rack piston. The worm shaft is supported at lower end by a thrust bearing with 2 races. It is supported at upper end by a bearing assembly in the adjuster plug. Control valves, located inside steering gear housing, direct power steering fluid to either side of rack piston. See **Fig. 1** .

Steering linkage connects steering gear to front wheels through pitman arm. Steering linkage consists of pitman arm, idler arm, relay rod and tie rods. See **Fig. 2** and **Fig. 3** . Tie rod ends connect to relay rod by ball studs. Adjuster tubes between inner and outer tie rod ends are used to adjust toe. Some models have a shock absorber attached to relay rod.

Two different types of vane-type power steering pumps are used. The Model "P" pump is mounted inside reservoir. See **Fig. 9** . The Model "CB" pump is mounted below reservoir. See **Fig. 11** . On both models, vanes are driven by a rotor and move fluid from intake to pressure cavities of pump ring.

1. Retaining Ring
2. Housing End Plug
3. Seal
4. Ring
5. Seal
6. Rack Piston End Plug
7. Rack Piston
8. Screw
9. Clamp
10. Ball Guide
11. Recirculating Ball
12. Side Cover Bolt
13. Pitman Shaft Lock Nut
14. Side Cover
15. Gasket
16. Check Valve
17. Pitman Shaft
18. Steering Gear Housing
19. Worm Bearing Race
20. Worm Bearing
21. Worm Bearing Race
22. Worm Shaft
23. Pin
24. Seal
25. Stub Shaft
26. Pitman Shaft Bearing
27. Double Lip Seal
28. Seal
29. Washer
30. Single Lip Seal
31. Retaining Ring
32. Bearing Race
33. Bearing
34. Adjuster Plug
35. Spring Washer
36. Nut
37. Valve Spool
38. Valve Body
39. Spacer
40. Bearing Retainer
41. Lock Nut

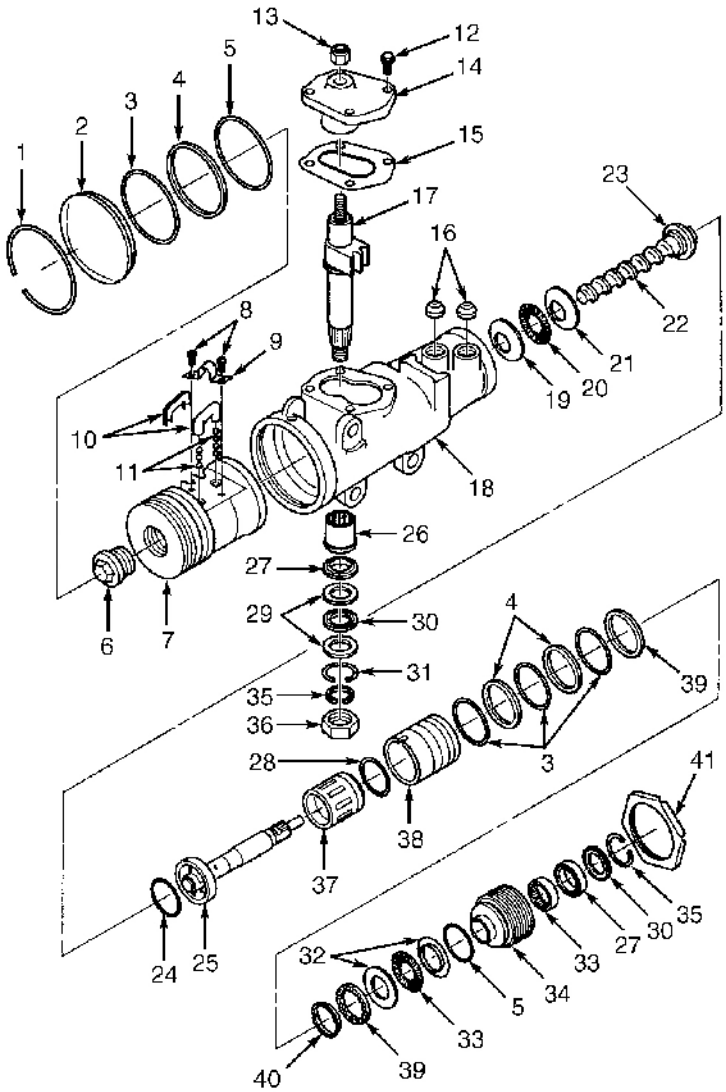


Fig. 1: Exploded View Of Power Steering Gear
Courtesy of GENERAL MOTORS CORP.

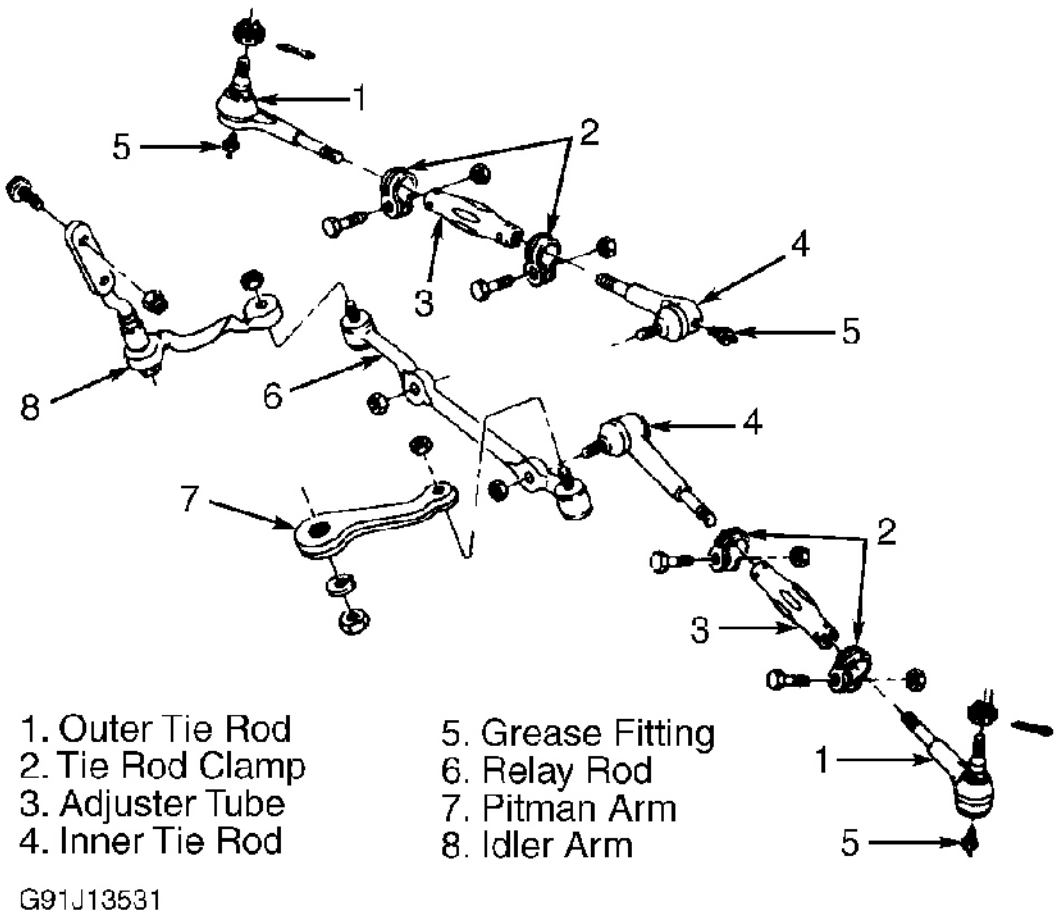


Fig. 2: Exploded View Of Steering Linkage (2WD)
Courtesy of GENERAL MOTORS CORP.

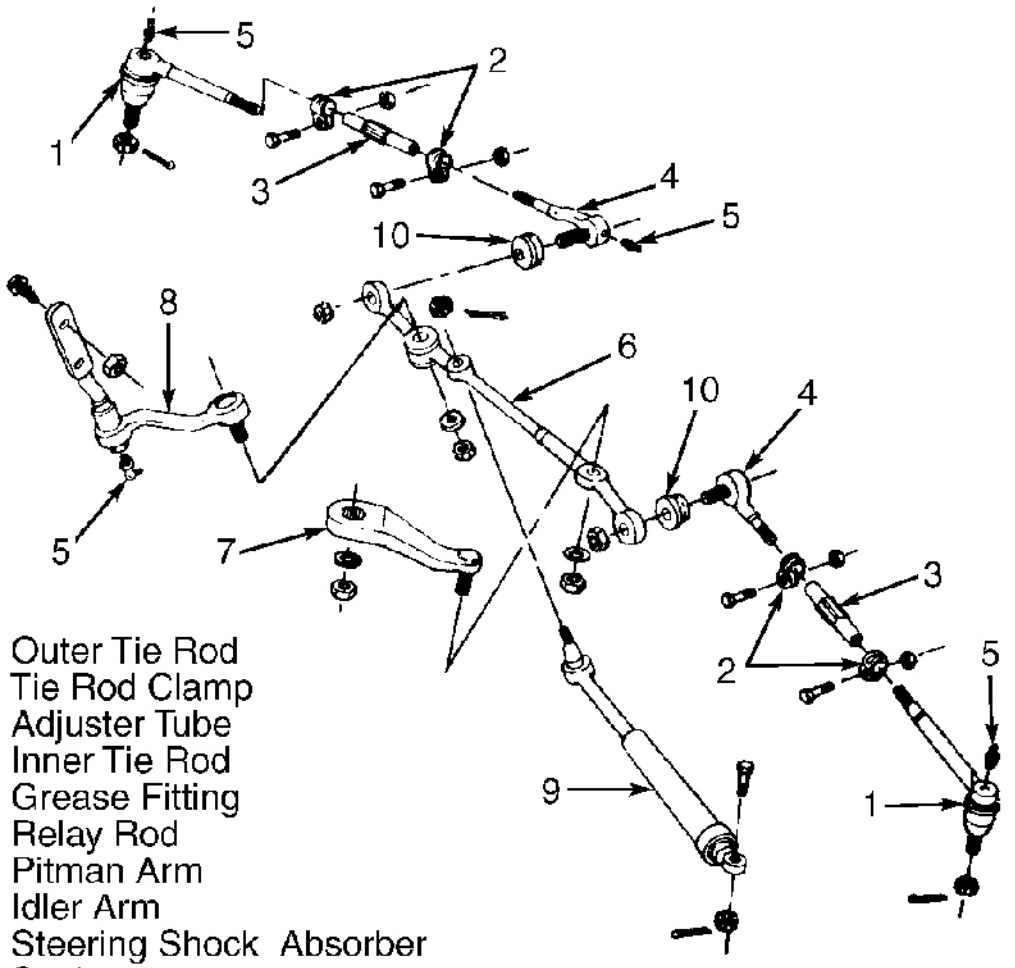


Fig. 3: Exploded View Of Steering Linkage (4WD)
Courtesy of GENERAL MOTORS CORP.

TROUBLE SHOOTING

NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in GENERAL TROUBLE SHOOTING section.

TESTING

HYDRAULIC SYSTEM PRESSURE TEST

1. Ensure belt tension is correct. Disconnect high pressure line from power steering pump. Connect Power Steering Pressure Gauge (J-5176-D) hose to power steering pump fitting. Connect other hose from valve side of tester to steering gear inlet.

2. Open valve on pressure gauge. Check fluid level and add fluid as necessary. Check for possible leaks at pressure gauge connections. Bleed air from system. See **HYDRAULIC SYSTEM BLEEDING** under LUBRICATION. Run engine until fluid reaches normal operating temperature of 150-170°F (66-77°C). Check fluid level and add fluid as necessary.
3. Note pressure reading with valve open and engine idling. Pressure should be 80-125 psi (6-9 kg/cm^2). If pressure exceeds 200 psi (14 kg/cm^2), check hoses for restrictions and poppet valve for proper assembly.

CAUTION: To prevent pump damage, DO NOT hold gauge valve closed for more than 5 seconds.

4. Completely close and open valve 3 times. Record highest reading each time. Readings should be within specification. See **PRESSURE TEST SPECIFICATIONS** table.
5. If pressure readings are within specification and within 50 psi (4 kg/cm^2) of each other, pump is operating properly.
6. If readings are within specification but not within 50 psi (4 kg/cm^2) of each other, flow control valve in pump is sticking. Remove valve, but DO NOT disassemble it. Clean valve. Flush system if dirty.
7. If pressure is constant but more than 100 psi (7 kg/cm^2) below specification, clean or replace flow control valve in pump. If readings are still low, replace pump.
8. If pressure readings are as specified, turn steering wheel from stop to stop with valve open. Record highest pressure with wheels at both stops. If highest pressure is not equal to highest pressure recorded in step 2), steering gear is leaking internally. Repair or replace assembly.
9. Turn engine off. Remove tester. Reconnect pressure hose. Check fluid level. Bleed hydraulic system. See **HYDRAULIC SYSTEM BLEEDING** under LUBRICATION.

PRESSURE TEST SPECIFICATIONS

Idle Pressure psi (kg/cm^2)	Relief Pressure psi (kg/cm^2)
80-125 (6-9)	1100-1200 (77-84)

LUBRICATION

FLUID TYPE

Manufacturer recommends General Motors Power Steering Fluid (1050017) or an equivalent. Failure to use proper fluid will cause hose and seal damage.

FLUID LEVEL CHECK

To check fluid level, run engine until power steering fluid reaches normal operating temperature, about 170°F (77°C). Turn engine off. Remove fluid reservoir cap, and check level gauge. On models with remote reservoir, fluid level should be 1/2"-1" from top of reservoir with wheels turned fully left. Add fluid through fluid reservoir cap as necessary, and recheck fluid level. DO NOT overfill system.

HYDRAULIC SYSTEM BLEEDING

1. Fill reservoir to correct level. Allow fluid to settle for no less than 2 minutes. Start engine and run for 30-60 seconds, then turn off. Check fluid level and add fluid (as necessary). Repeat procedure until fluid level in reservoir remains constant.
2. Raise and support vehicle with both front wheels off ground. Start engine. Turn wheels right and left, lightly contacting stops. Check fluid level and add fluid (as necessary).
3. Lower vehicle. Turn wheels right and left, slowly from lock to lock. Turn off engine. Check fluid level and add fluid (as necessary). If fluid is foamy, allow vehicle to sit for a few minutes and repeat bleeding procedure.

ADJUSTMENTS

NOTE: Adjust worm bearing preload before performing over-center preload adjustment.

POWER STEERING PUMP BELT

BELT TENSION (1)

Application	New Belt	Used Belt
Serpentine Belt	(2)	(2)
"V" Belt	146	67

(1) Tension in lbs. using V-belt tension gauge

(2) Serpentine belts are equipped with self-tensioner; adjustment is not required.

WORM BEARING PRELOAD

1. Remove steering gear from vehicle and mount in vise before performing preload adjustments. See STEERING GEAR under REMOVAL & INSTALLATION. Remove worm bearing adjuster lock nut. See **Fig. 1** . Using spanner wrench, turn adjuster plug clockwise until plug is seated in housing. Torque should be about 20 ft. lbs. (27 N.m).
2. Index mark housing even with one hole in adjuster plug. See **Fig. 4** . Measure back 1/2" counterclockwise from first index mark. Mark housing with second index mark. Rotate adjuster plug back counterclockwise until hole in adjuster plug aligns with second index mark on housing. Install and tighten adjuster plug lock nut. Ensure adjuster plug remains

in position.

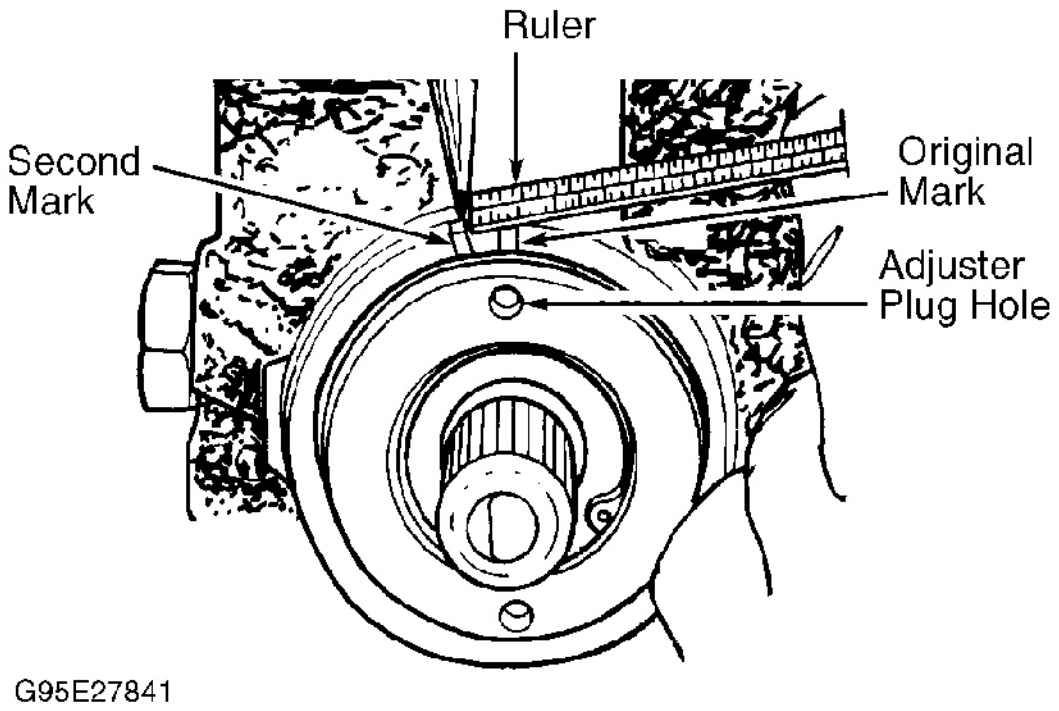


Fig. 4: Measuring Worm Bearing Preload
Courtesy of GENERAL MOTORS CORP.

OVER-CENTER PRELOAD

1. With worm bearing preload adjusted, rotate stub shaft slowly from stop to stop while counting total number of turns. With stub shaft positioned at either stop, rotate stub shaft back 2/3 total number of turns counted. Stub shaft should be back to exact center position. Flat on stub shaft should be facing upward and parallel to side cover and master spline on pitman shaft should be aligned with adjuster screw.
2. Turn pitman shaft adjuster screw counterclockwise until extended, then back off one full turn. Place INCH-lb. torque wrench in vertical position on end of stub shaft. Measure gear over-center torque by rotating torque wrench attached to stub shaft in a 90 degree arc, 45 degrees on each side of center. See **Fig. 5** . Record highest degree of arc on each side of center. Record highest reading.
3. Turn adjuster screw in until torque required to rotate stub shaft is 6-10 INCH lbs. (.6-1.1 N.m) greater than reading in step 2). Continue adjustment until over-center reading is within specification. See **LASH ADJUSTMENT PRELOAD** table. Tighten adjuster screw lock nut when reading is obtained.

LASH ADJUSTMENT PRELOAD

Application	Over-Center INCH Lbs. (N.m)	(1) Total INCH Lbs. (N.m)
New Gears	6-10 (0.7-1.1)	18 (2.0)
Used Gears (2)	4-5 (.5-.6)	14 (1.6)

(1) Total preload is sum of worm bearing and over-center preload.

(2) In service for more than 400 miles.

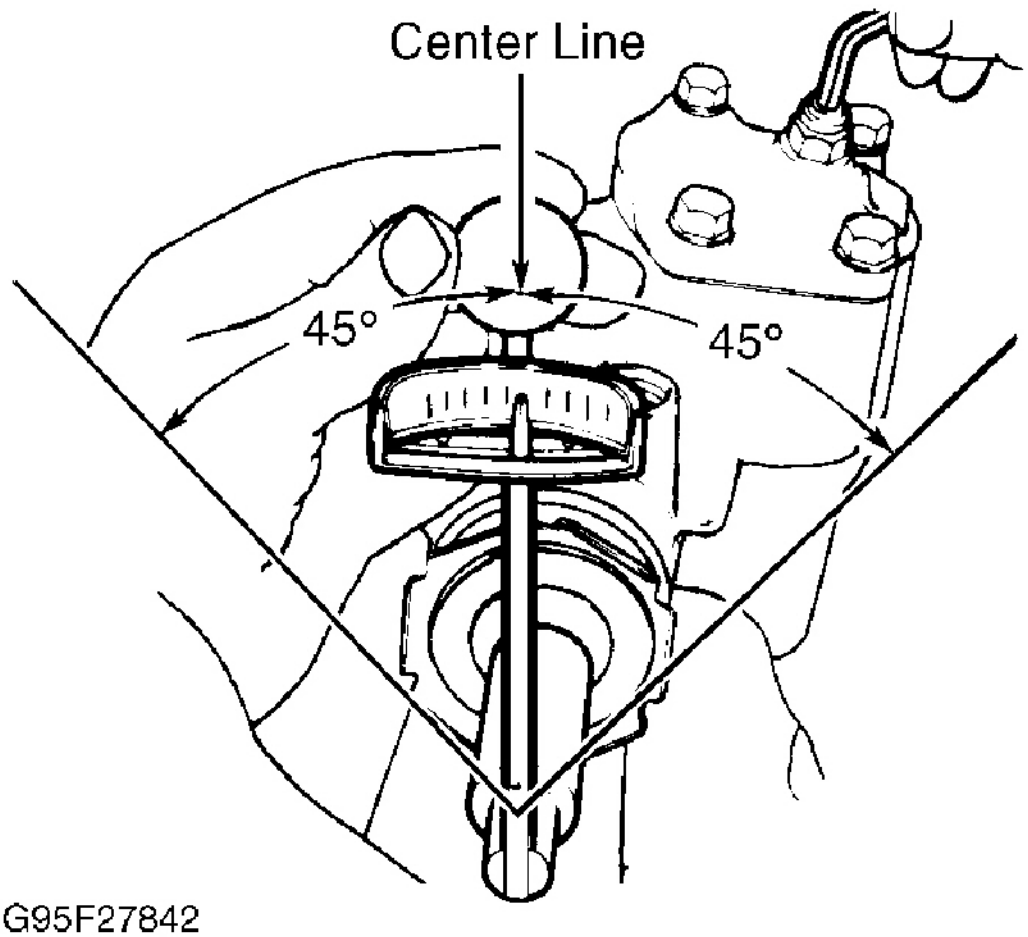


Fig. 5: Adjusting Over-Center Preload
Courtesy of GENERAL MOTORS CORP.

REMOVAL & INSTALLATION

STEERING GEAR

Removal

1. Center steering gear. Raise and support vehicle. Place drain pan under steering gear assembly. Disconnect return and feed lines from steering gear. Cap ends of lines and steering gear fittings. Remove flexible coupling-to-intermediate shaft retaining screw. Remove flexible coupling (if equipped). Remove shield from intermediate shaft (if equipped).
2. Mark alignment of lower clamp to steering shaft. Remove lower clamp bolt from steering shaft. Mark relationship of pitman arm-to-pitman shaft. Remove pitman arm nut and spring washer. Remove pitman arm using Puller (J-6632-01) or Remover (J-29107). Remove steering gear mounting bolts and washers. Remove steering gear.

Installation

To install, reverse removal procedure. Ensure lower clamp bolt hole is aligned with groove in worm shaft (if equipped). Ensure pitman arm-to-pitman shaft reference marks are aligned. Tighten bolts and nuts to specification. See **TORQUE SPECIFICATIONS** . Fill reservoir (if necessary). Bleed air from system. See **HYDRAULIC SYSTEM BLEEDING** under LUBRICATION.

POWER STEERING PUMP

Removal

1. Place drain pan under steering pump assembly. Disconnect return and feed lines from steering pump. Cap ends of lines and steering pump fittings.
2. Unload power steering pump belt tensioner (if equipped). Remove power steering pump belt. Remove bracket mounting nuts, and remove bracket (if equipped). Using Pulley Remover (J-25034-B), remove pulley from pump shaft. Remove pump mounting bolts and remove pump.

Installation (All Models)

To install, reverse removal procedure. Use Pulley Installer (J-25033-B) to install pulley. Install pulley flush with end of pump shaft plus or minus .010" (.25 mm). Tighten bolts and nuts to specification. See **TORQUE SPECIFICATIONS** . Fill reservoir (if necessary). Bleed air from system. See **HYDRAULIC SYSTEM BLEEDING** under LUBRICATION.

INNER & OUTER TIE ROD ENDS

Removal

Raise and support vehicle. Remove cotter pins and outer tie rod end nuts. Remove inner tie rod end nuts. Using Wheel Stud and Tie Rod Remover (J-6627-A), remove outer tie rod ball studs from steering knuckle and inner tie rod ball studs from relay rod. On Commercial Van

with I-Beam Axle, remove shock absorber from tie rod. On all models, loosen adjuster tube clamp bolts and clamps. Unscrew and remove tie rod ends from adjuster tube.

Installation

1. Lubricate tie rod end threads with chassis lubricant before installing. Install inner and outer tie rod ends to adjuster tube. Inner and outer tie rod end threads must be adjusted equally within 3 threads. Install adjuster clamps and clamp bolts. Ensure clamps are positioned between locating dimples on ends of adjuster tube.
2. Tie rod ends must rotate full travel and travel must be maintained during clamp tightening. Slot in adjuster tube and slot in clamp must be properly positioned.
3. Install inner tie rod ends to relay rod ensuring seal is on ball stud. Tighten Steering Linkage Installer (J-29193 or J-29194) to 40 ft. lbs. (54 N.m) to seat tapers. Install and tighten inner tie rod end-to-relay rod nuts. Install outer tie rod end to steering knuckle.

CAUTION: When installing outer tie rod end nut, tighten nut to align cotter pin hole. DO NOT tighten nut more than an additional 1/6 turn to align cotter pin hole. DO NOT back off nut to insert cotter pin.

4. Install and tighten outer tie rod end nut. Tighten bolts and nuts to specification. See **TORQUE SPECIFICATIONS** . Adjust toe-in. See WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURES article in WHEEL ALIGNMENT section.

RELAY ROD

Removal

1. Raise and support vehicle. Remove inner tie rod end nuts. Remove inner tie rod ends from relay rod (if equipped). On models without inner tie rods, remove tie rod end-to-steering knuckle nuts. Separate tie rod ends from steering knuckle.
2. On all models, remove steering shock absorber nut from relay rod (if equipped). Using Steering Linkage Puller (J-24319-01), remove steering shock absorber from relay rod (if equipped). Remove connecting rod nut and remove connecting rod from relay rod (if equipped).
3. Remove relay rod end nuts from pitman arm and idler arm. Using Steering Linkage Puller (J-24319-01), remove pitman arm and idler arm from relay rod. Remove relay rod. See **Fig. 2** and **Fig. 3** .

Installation

Reverse removal procedure. Ensure seals are on ball studs. Using Steering Linkage Installer (J-29193 or J-29194), seat all tapers to 40 ft. lbs. (54 N.m). Tighten nuts to specification. See **TORQUE SPECIFICATIONS** . Adjust toe-in. See WHEEL ALIGNMENT

SPECIFICATIONS & PROCEDURES article in WHEEL ALIGNMENT section.

IDLER ARM

NOTE: Replace idler arm assembly if an up and down force of 25 ft. lbs. (110 N.m), applied at relay rod end of idler arm, produces a lash of more than 1/8" (3 mm) for a total of 1/4" (6 mm) in straight-ahead position. See Fig. 6 .

Removal

Raise and support vehicle. Remove idler arm-to-frame nut and bolt. Remove idler arm nut and spring washer from relay rod. Using Steering Linkage Puller (J-24319-01), remove idler arm from relay rod. Remove idler arm. See **Fig. 2** and **Fig. 3** .

Installation

To install, reverse removal procedure. Ensure seal is on ball stud. Using Steering Linkage Installer (J-29193 or J-29194), seat tapers to 40 ft. lbs. (54 N.m). Tighten nuts to specification. See **TORQUE SPECIFICATIONS** . Adjust toe-in. See WHEEL ALIGNMENT SPECIFICATIONS & PROCEDURES article in WHEEL ALIGNMENT section.

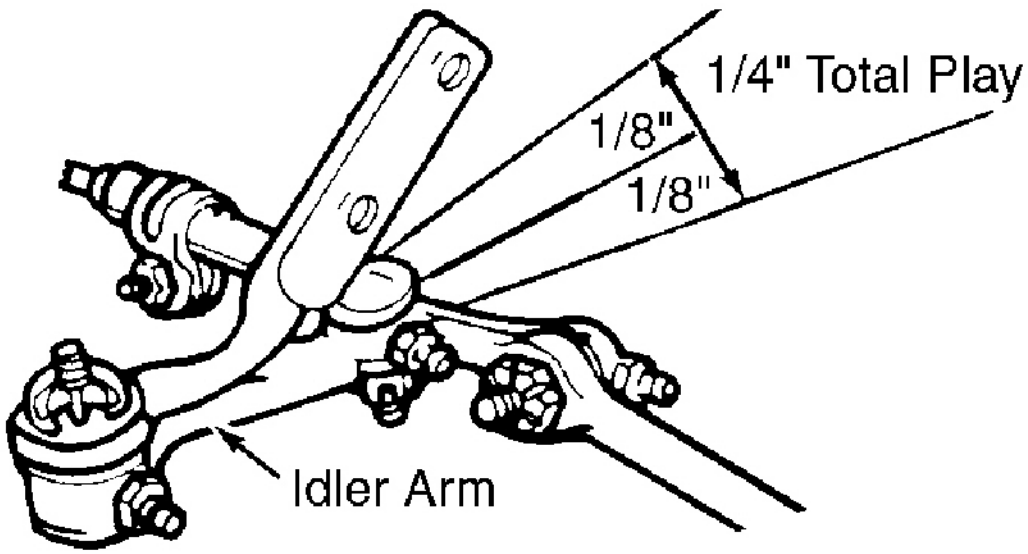


Fig. 6: Checking Idler Arm Play

Courtesy of GENERAL MOTORS CORP.

PITMAN ARM

Removal

1. Raise and support vehicle. Disconnect air induction assembly. Slide up intermediate shaft cover. Mark intermediate shaft for reassembly. Remove intermediate shaft. Disconnect oil filter lines at crossmember bracket. Remove splash shield.
2. Remove pitman arm nut and spring washer from relay rod. Using Steering Linkage Puller (J-24319-01), remove pitman arm from relay rod.
3. Remove lower steering gear bolts. LOOSEN upper steering gear bolt. Rotate steering gear for pitman arm clearance at crossmember, and support gear using block of wood.
4. Mark pitman arm-to-pitman shaft position. Remove pitman arm nut and spring washer from pitman shaft. Using Remover (J-6632-01) or Puller (J-29107), remove pitman arm from pitman shaft. See **Fig. 2** and **Fig. 3** .

Installation

To install, reverse removal procedure. Ensure pitman arm-to-pitman shaft reference marks are aligned. Ensure seal is on ball stud. Using Steering Linkage Installer (J-29193 or J-29194), seat tapers to 40 ft. lbs. (54 N.m). Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .

CONNECTING ROD

Removal

Raise and support vehicle. Remove connecting rod nuts from pitman arm and relay rod. Using Steering Linkage Puller (J-24319-01), remove connecting rod from pitman arm and relay rod.

Installation

To install, reverse removal procedure. Ensure seal is on ball stud. Using Steering Linkage Installer (J-29193 or J-29194), seat tapers to 40 ft. lbs. (54 N.m). Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .

STEERING SHOCK ABSORBER

Removal

Remove steering shock absorber nut from relay rod. Using Steering Linkage Puller (J-24319-01), remove steering shock absorber from relay rod. Remove steering shock absorber-to-frame nut and bolt. Remove steering shock absorber.

Installation

Reverse removal procedure. Ensure seal is on ball stud. Using Steering Linkage Installer (J-29193 or J-29194), seat tapers to 40 ft. lbs. (54 N.m). Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .

OVERHAUL

STEERING GEAR

Disassembly

1. Mount steering gear in vise, clamping onto one mounting tab. Pitman shaft should be in a vertical position. Insert punch through housing access hole to unseat retaining ring. Pry retaining ring out of groove in housing.
2. Rotate stub shaft counterclockwise to force housing end plug from housing. Remove seals and ring. Using Rack Piston Arbor (J-21552) and socket, remove rack piston end plug from rack piston.
3. Remove side cover bolts. Remove pitman shaft nut and spring washer from lower end of shaft retaining pitman arm. Remove pitman shaft and side cover assembly. Remove pitman shaft adjuster screw lock nut. Remove pitman shaft cover. Remove gasket from side cover.
4. Remove pitman shaft lower dust seal and rubber boot (if equipped). Using snap-ring pliers, remove pitman shaft lower retaining ring. Remove pitman shaft lower seals and washer. Using Pitman Shaft Bearing Puller (J-6278), remove pitman shaft bearing from housing.
5. Insert Rack Piston Arbor (J-21552) into end of rack piston assembly until arbor seats into end of worm shaft. Threaded arbor will keep recirculating balls from falling out of rack piston. Rotate stub shaft counterclockwise, forcing rack piston onto arbor. Remove rack piston and arbor assembly. Ensure arbor is fully inserted so recirculating balls will not fall out.
6. Remove adjuster plug lock nut. Using spanner wrench, remove adjuster plug. Remove valve body, stub shaft, worm shaft, seal, bearing races and worm bearing assembly from housing. If further disassembly is required, see appropriate component under **OVERHAUL** .

Inspection

Clean components using solvent, and blow dry. Avoid wiping valve components using cloth. Lint may cause binding of mechanism. DO NOT steam clean hydraulic parts.

Reassembly

1. Lubricate components with power steering fluid before reassembly. Install valve body, stub shaft and worm shaft assembly into housing.

2. Place seal protector over stub shaft. Install adjuster plug until it seats against valve body. Remove seal protector from housing. Loosely install adjuster plug lock nut. Insert rack piston (with arbor to retain recirculating balls) into housing. Align worm shaft and rack piston. Turn stub shaft clockwise to engage worm shaft. Maintain pressure on arbor until worm shaft is fully engaged. Remove arbor.
3. Install NEW pitman shaft side cover gasket. Thread pitman shaft side cover onto adjuster screw until it bottoms. Back off 1/2 turn. Install pitman shaft so center sector gear tooth meshes with center groove in rack piston. Install side cover bolts.
4. Install adjuster screw lock nut halfway onto pitman shaft. Install rack piston end plug in rack piston. Install housing end plug seals, ring, end plug and retainer ring. Adjust worm shaft bearing preload and over-center preload. See **WORM BEARING PRELOAD** and OVER-CENTER PRELOAD under ADJUSTMENTS.

ADJUSTER PLUG

Disassembly

Using snap-ring pliers, remove adjuster plug retaining ring. Remove adjuster plug washer and seal. Using screwdriver, pry up bearing retainer at raised area. Using Bearing Remover (J-8524-1) and Driver (J-7079-2), remove bearing from adjuster plug.

Inspection

Inspect bearings and races for scoring, pitting and wear. Inspect adjuster plug threads for damage.

Reassembly

Using Bearing Remover (J-8524-1) and Driver (J-7079-2), install bearing into adjuster plug. Install bearing retainer. Lubricate seal with power steering fluid. Install adjuster plug seal, washer and retaining ring.

NOTE: Retainer projections must not extend beyond washer when retaining ring is seated. Adjuster plug washer must be free to rotate.

WORM SHAFT, STUB SHAFT & VALVE BODY

Disassembly

1. Mark position of worm bearing races and bearing to worm shaft. Mark position of worm shaft notches to valve body. Remove worm shaft from valve body and stub shaft assembly. Remove stub shaft seal. Remove worm bearing races and bearing from worm shaft.

2. Lightly tap end of stub shaft against wood block until shaft cap is free of valve body. Pull stub shaft outward until drive pin hole is visible. See **Fig. 7** .

CAUTION: DO NOT pull shaft more than 1/4" (6 mm) or spool valve may become cocked in valve body.

3. Disengage drive pin. Remove stub shaft from valve body. Rotate and remove valve spool from valve body. If binding occurs, realign valves.

CAUTION: DO NOT force stub shaft or valve spool out of valve body.

4. Remove spool valve seal. Remove valve body rings and seals.

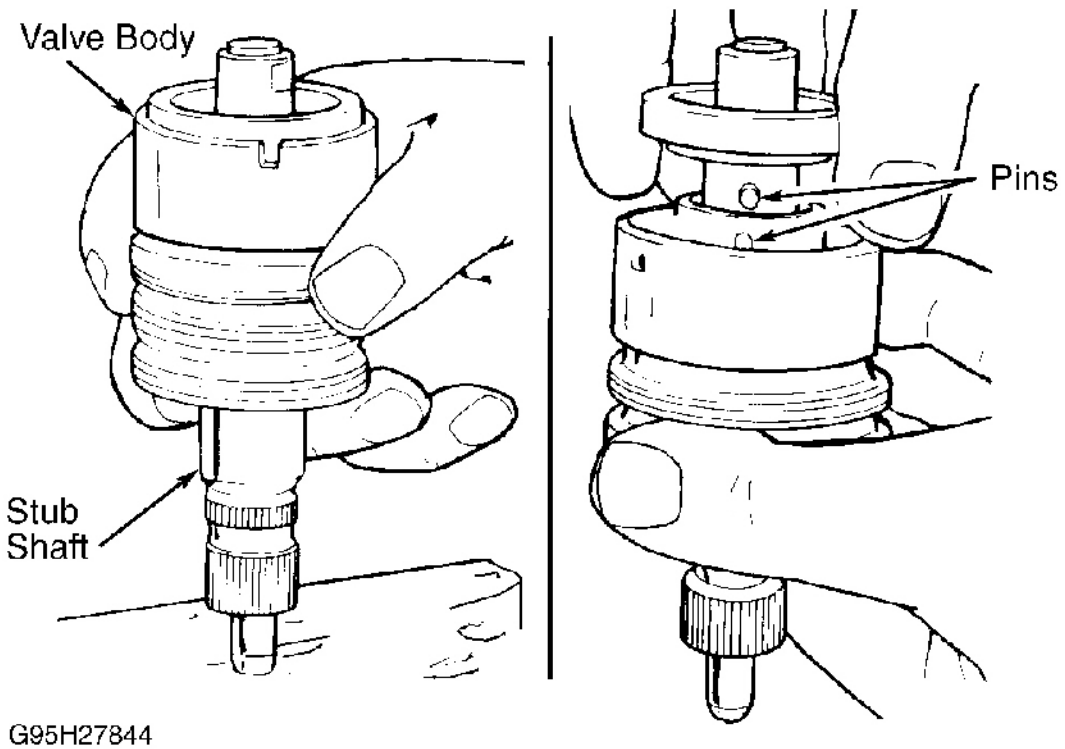


Fig. 7: Removing Stub Shaft From Valve Body
Courtesy of GENERAL MOTORS CORP.

Inspection

1. Clean components using solvent, and blow dry. Inspect stub shaft for nicks and burrs. Remove nicks and burrs using crocus cloth if possible. Inspect shaft pin for wear and cracks.

2. Check valve spool fit in valve body. Remove nicks and burrs using crocus cloth if possible. Lubricate valve spool with power steering fluid. Rotate valve spool in valve body. If valve spool does not rotate freely, replace complete valve and stub shaft assembly.
3. Valve assembly is balanced during assembly. If replacing any components other than rings or seals, replace complete valve and stub shaft assembly.

Reassembly

1. Lubricate valve body components with power steering fluid. Install NEW rings and seals. Lubricate spool valve seals with power steering fluid and install on valve spool. Carefully insert valve spool into valve body.
2. Push valve spool through valve body until locating pin hole is visible at opposite end of valve body, and valve spool is flush with notched end of valve body. Install stub shaft into valve spool and valve body.
3. Align stub shaft locating pin with valve spool locating hole. Align notch in stub shaft cap with pin in valve body. Install stub shaft seal into valve body.

CAUTION: Before installing assembled valve body into gear housing, ensure valve body stub shaft locating pin is fully engaged in stub shaft cap notch. DO NOT allow stub shaft to disengage from valve body pin.

4. Install bearing and races on worm shaft, aligning marks made during disassembly. See **Fig. 1** . Install worm shaft onto valve body and stub shaft assembly, aligning notches made during disassembly.

RACK PISTON BALLS

Disassembly

Remove ball guide clamp screws and clamps. Remove ball guides. Remove all recirculating balls from rack piston. See **Fig. 1** .

Inspection

Clean components using solvent, and blow dry. Inspect rack piston grooves for scoring. Inspect ball bearings for damage. If any ball bearings are damaged, replace entire set. Check ball guides for cracks or dented ends. Inspect rack piston teeth for chips, cracks, dents and scoring. If rack piston is damaged, replace rack piston and worm shaft as an assembly.

Reassembly

1. Lubricate seals and ring with power steering fluid and carefully install onto rack piston.

Install worm shaft into rack piston until worm shaft touches piston shoulder. While turning worm shaft counterclockwise, insert ball bearings into rack piston.

NOTE: Ensure light and dark colored balls are installed alternately; Black balls are .0005" (.013 mm) smaller than Silver balls.

2. Install 6 balls in ball guide, alternating ball colors. Bearings in guide must be in sequence with bearings in rack piston. Hold balls in place with chassis lubricant. Install return ball guide assembly into position.
3. Install clamp. Tighten clamp screws. See **Fig. 8** . Insert Rack Piston Arbor (J-21552) into rack piston until it contacts worm shaft. Maintain pressure on arbor, and back worm shaft out of rack piston. DO NOT allow ball bearings to drop out.

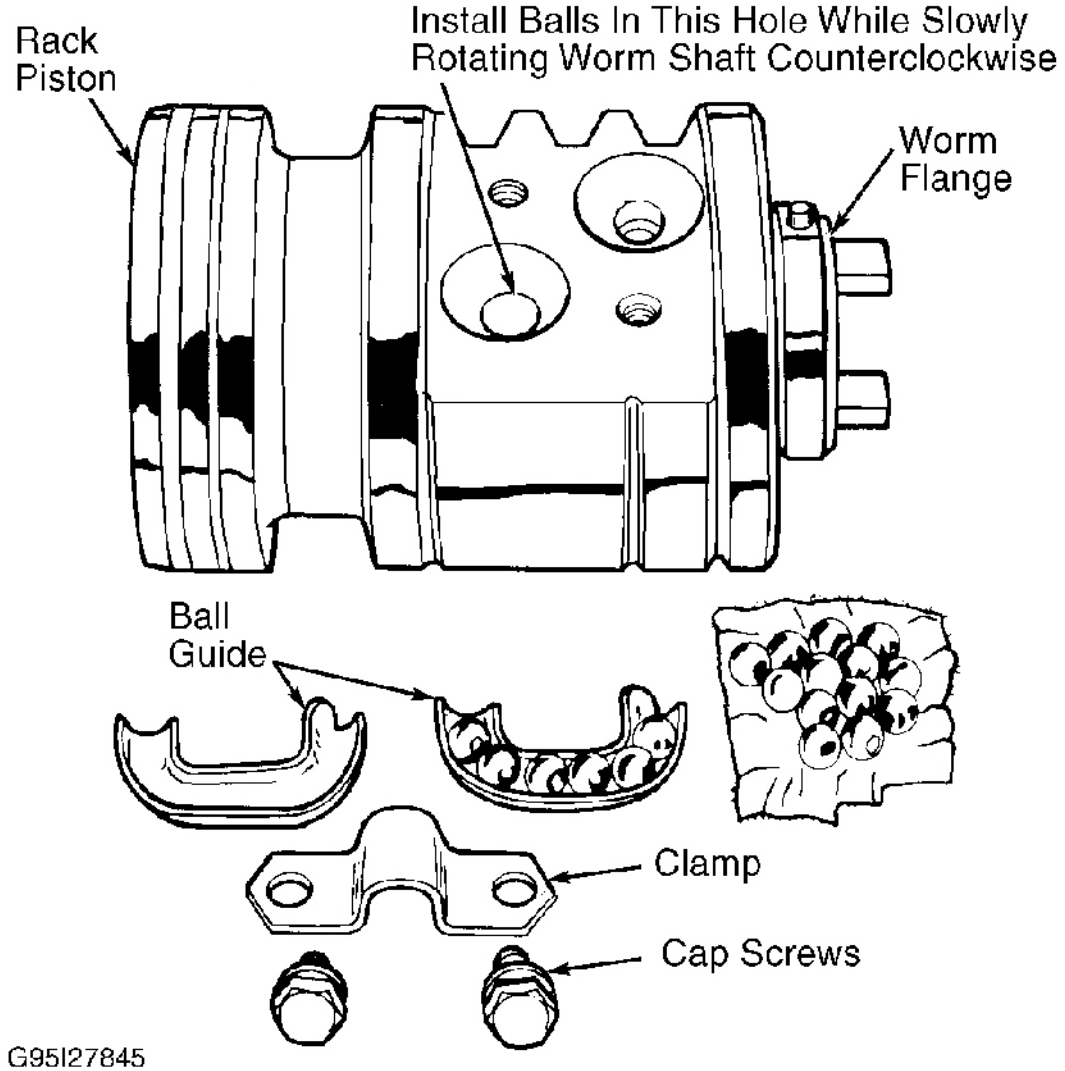


Fig. 8: Installing Ball Bearing Into Rack Piston

Courtesy of GENERAL MOTORS CORP.

POWER STEERING PUMP

Disassembly (Model "P")

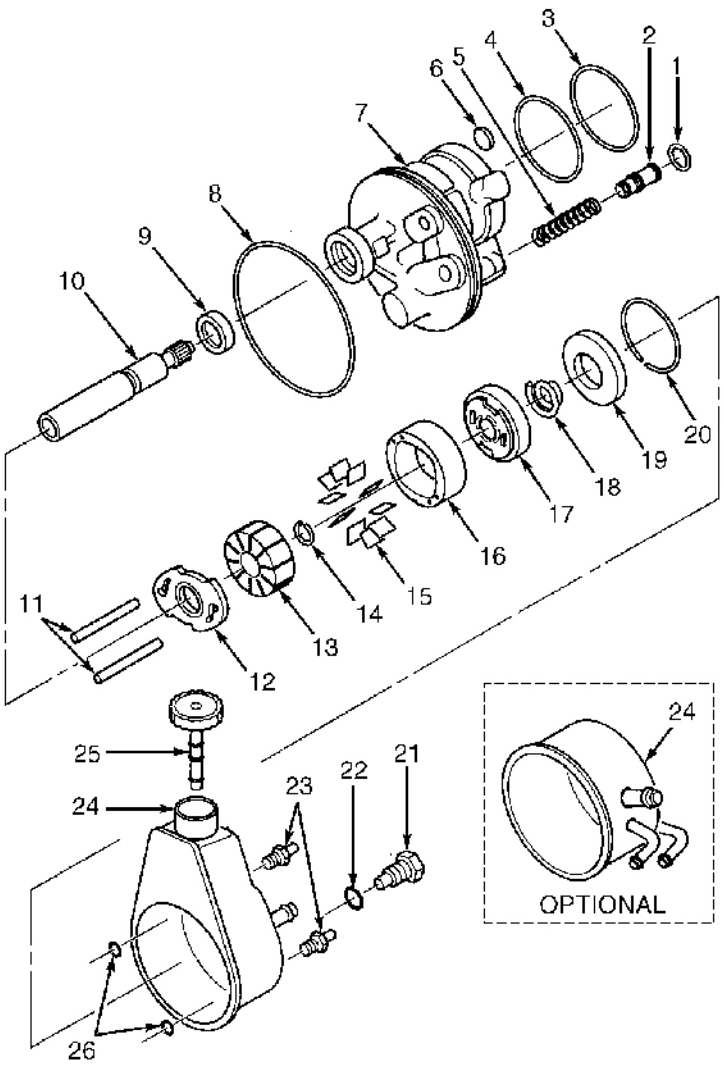
1. Using Puller (J-29785-A), remove pulley from shaft if not previously removed. Remove union fitting and "O" ring. Remove reservoir retaining bolts. Remove reservoir and "O" rings from housing.
2. Using punch and screwdriver, remove end plate retaining ring. Remove end plate and pressure plate spring. See **Fig. 9** . Remove "O" ring, flow control valve, and spring. Using soft-faced hammer, tap end of drive shaft to loosen pressure plate.
3. Remove pressure plate, pump ring, vanes, retaining ring, rotor, and thrust plate assembly from housing. Remove drive shaft. Pry drive shaft seal from housing. Remove dowel pins and seals.

Inspection

1. Clean all pump components with solvent and blow dry. Inspect flow control valve assembly for wear, scoring, burrs and other damage. Inspect seal bore for burrs, nicks and score marks.
2. Inspect machined surfaces of body for scratches or burrs. Check "O" ring mating surfaces. Inspect drive shaft for excessive wear.
3. Inspect pump ring for roughness. Check thrust plate and pressure plate for scoring and wear. Ensure vanes slide freely but fit snugly into slots. If vanes are loose in slots, replace rotor and/or vanes.

Reassembly

1. Lubricate all "O" rings, seals, pump ring, rotor and vanes with power steering fluid. Using socket, press NEW drive shaft seal into housing.
2. Install dowel pins and all "O" rings. Install drive shaft and thrust plate. Install pump rotor into housing with counterbore facing drive shaft side of steering pump.
3. Install NEW drive shaft retaining ring, ensuring ring is seated in groove. Install vanes with rounded edges toward pump ring. Install pump ring and pressure plate. Install "O" ring, flow control valve, and spring.
4. Install pressure plate spring, end plate, and retaining ring. Install seals and reservoir. Install union fitting, "O" ring, and reservoir retaining bolts.



1. "O" Ring
2. Control Valve Assembly
3. "O" Ring
4. "O" Ring
5. Flow Control Spring
6. Magnet
7. Pump Housing Assembly
8. "O" Ring
9. Drive Shaft Seal
10. Drive Shaft
11. Dowel Pin
12. Thrust Plate
13. Pump Rotor
14. Retaining Ring
15. Pump Vane
16. Pump Ring
17. Pressure Plate
18. Pressure Plate Spring
19. End Plate
20. Retaining Ring
21. Connector Assembly
22. "O" Ring
23. Mounting Bolt
24. Reservoir Assembly
25. Cap
26. "O" Ring

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Fig. 9: Exploded View Of Power Steering Pump (Model "P")
Courtesy of GENERAL MOTORS CORP.

Disassembly (Model "CB")

1. Remove pump assembly from vehicle. Remove retaining clips between reservoir and housing and remove reservoir from housing.

2. Remove union fitting and "O" ring. Remove control valve assembly and flow control spring.
3. Protect drive shaft with shim stock and using a small chisel, cut drive shaft seal and remove. Using small drift punch, remove end cover retaining ring. See **Fig. 10** .

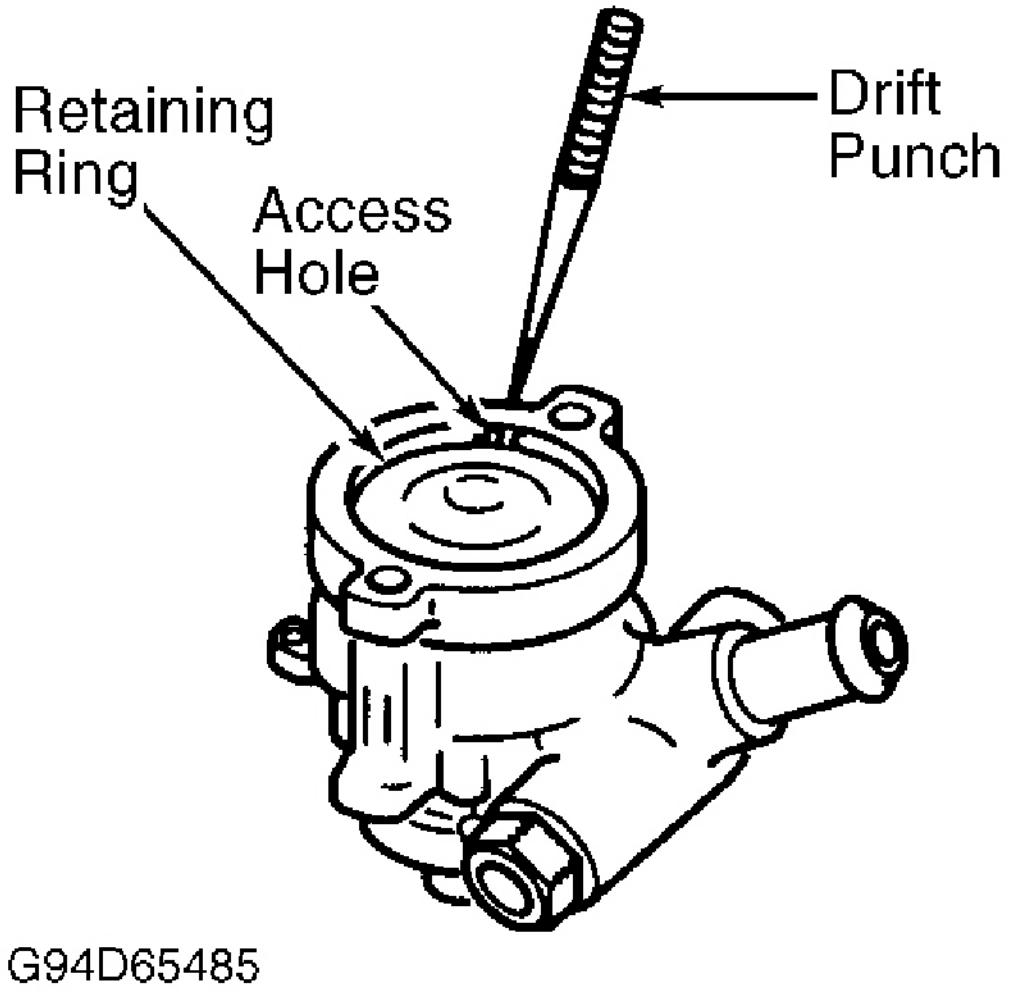

Fig. 10: Removing Retaining Ring (Pump Model "CB")
Courtesy of GENERAL MOTORS CORP.

4. Remove internal components of pump by gently pushing on drive shaft. See **Fig. 11** .

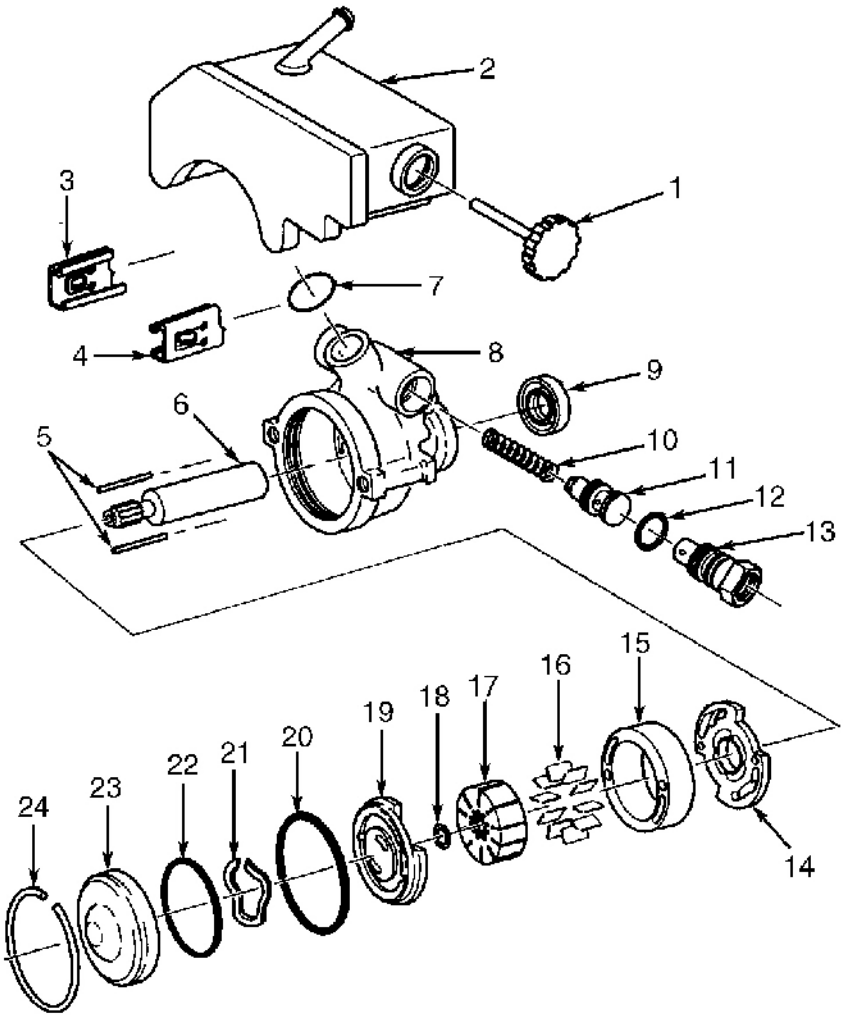

Fig. 11: Exploded View Of Power Steering Pump (Model "CB")
Courtesy of GENERAL MOTORS CORP.

5. Remove "O" ring from pump housing. Remove locating dowel pins. Remove drive shaft seal (if not already removed). Remove end cover, pressure plate spring and "O" ring from pressure plate.
6. Remove pump ring and vanes from drive shaft subassembly. Remove retaining ring from

drive shaft. Remove pump rotor and thrust plate from drive shaft.

Inspection

Clean all parts in power steering fluid and dry with compressed air. Inspect pressure plate, pump ring, vanes, thrust plate and drive shaft for scoring, pitting or chatter marks. Replace any damaged parts.

Reassembly

1. Lubricate NEW drive shaft seal with power steering fluid and drive seal into pump housing using Seal Driver (J-7728). See **Fig. 12** .

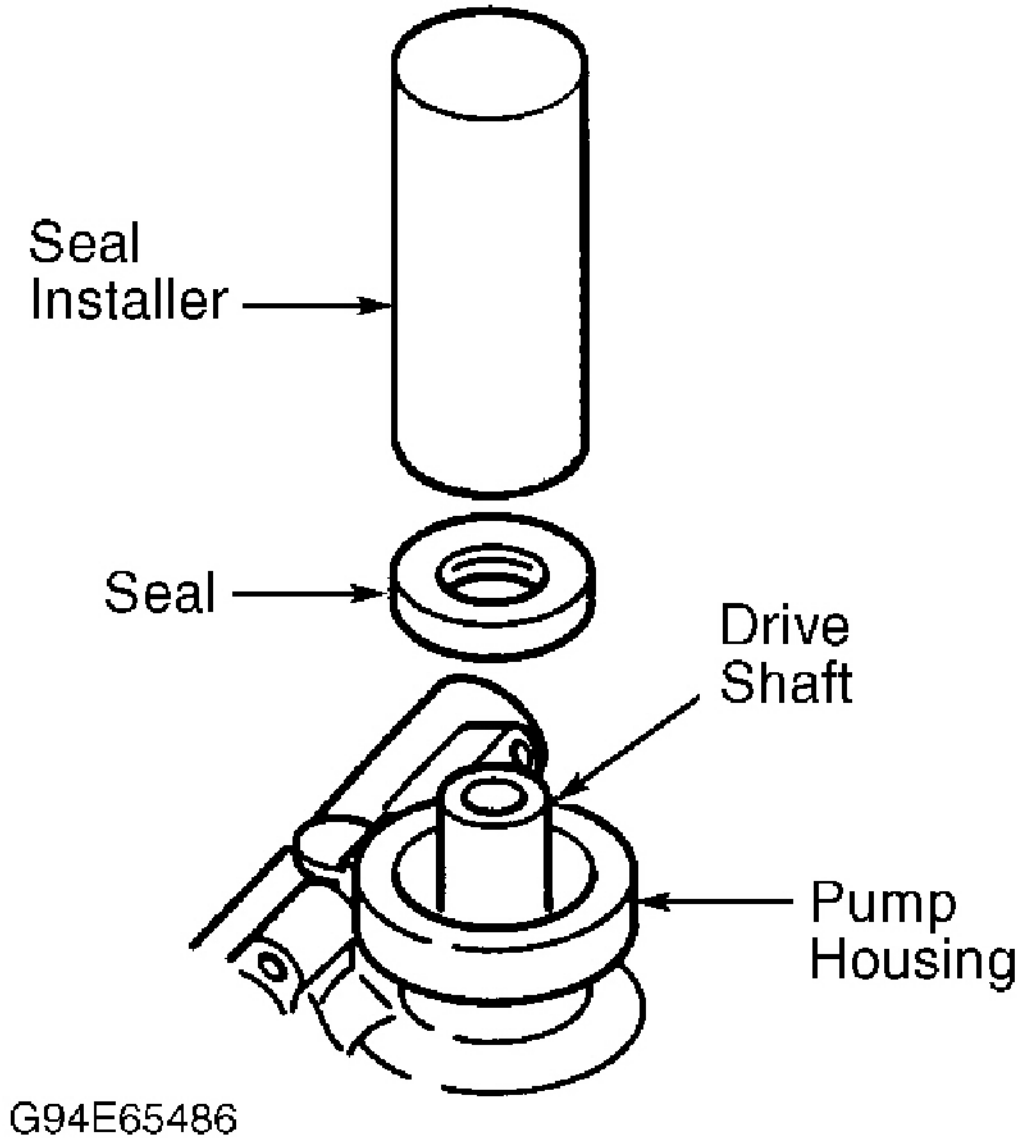

Fig. 12: Installing Drive Shaft Seal
Courtesy of GENERAL MOTORS CORP.

2. Install pump ring dowel pins into pump housing. Assemble thrust plate and pump rotor onto drive shaft. Fit NEW retaining ring to shaft. See **Fig. 13** .

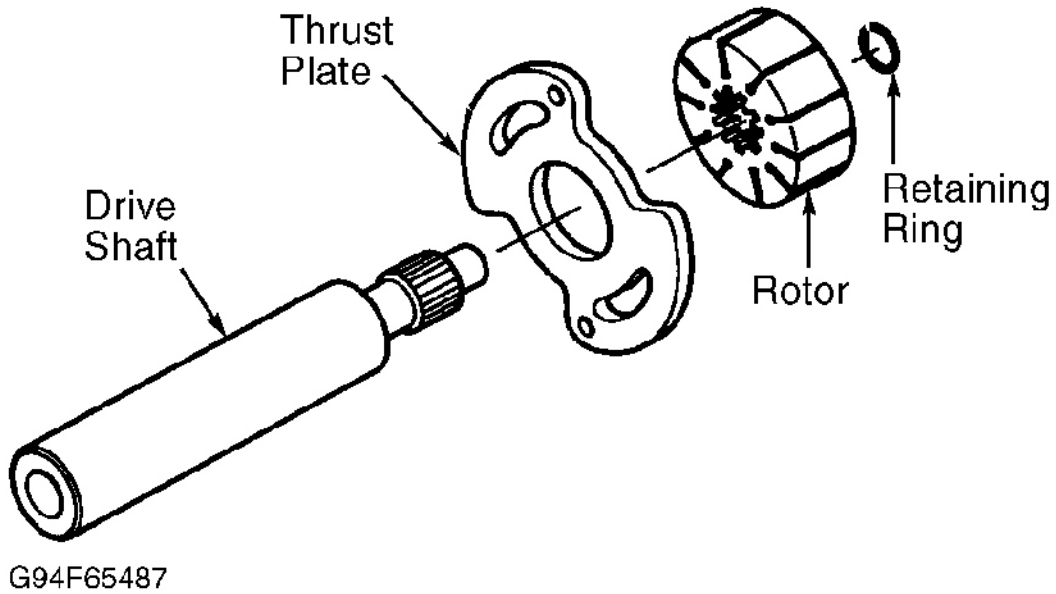

Fig. 13: Assembling Drive Shaft Subassembly
Courtesy of GENERAL MOTORS CORP.

3. Install drive shaft subassembly into pump housing. install vanes into pump rotor. With holes positioned correctly onto dowel pins, install pump ring into pump housing.
4. Lubricate NEW "O" ring with power steering fluid and install into pump body. Install pressure plate and pressure plate spring.
5. Lubricate NEW "O" ring with power steering fluid and install into end cover. Lubricate outer edge of end cover with power steering fluid. Press end cover into pump housing. When installing retaining ring into groove, ensure opening of ring is near access hole in pump housing. See **Fig. 14** .

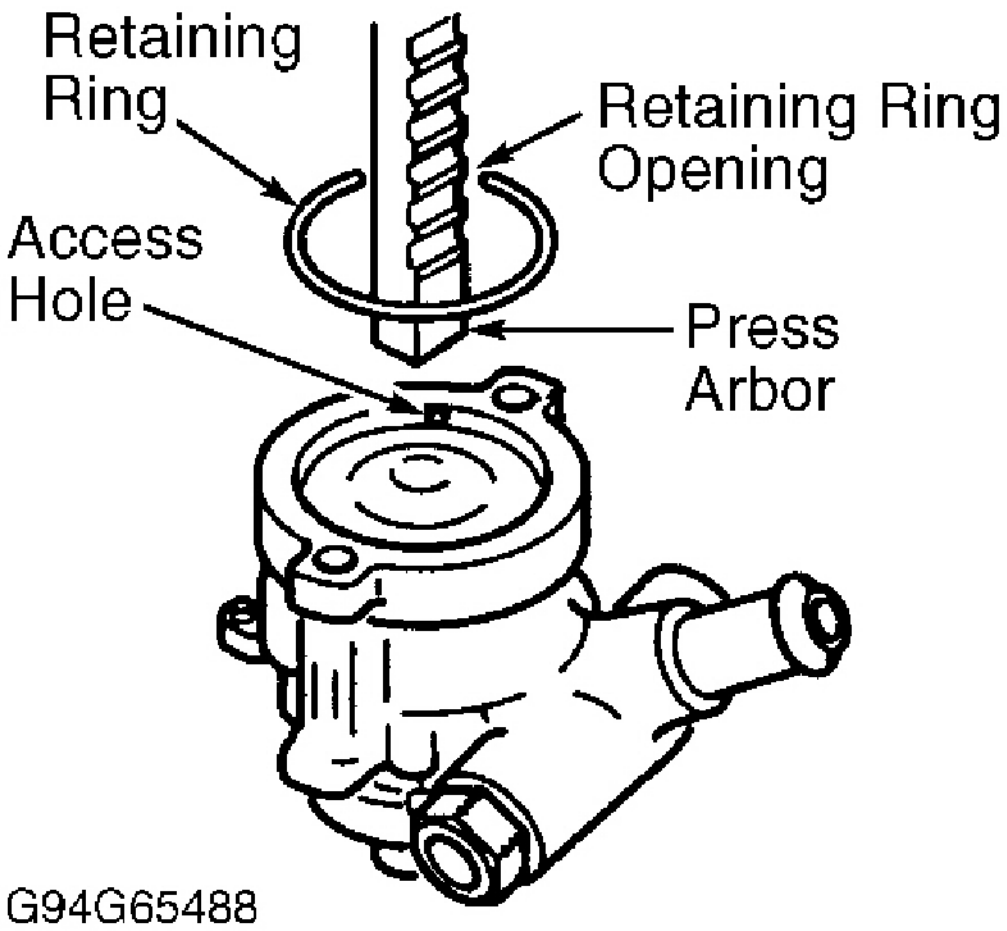

Fig. 14: Installing End Cover & Retaining Ring
Courtesy of GENERAL MOTORS CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Adjuster Plug Lock Nut	78-81 (106-110)
Idler Arm Mounting Bolts	60 (81)
Idler Arm-To-Relay Rod Nut	
2WD	35 (47)
4WD	60 (81)
Intermediate Shaft-To-Stub Shaft Bolt	26 (35)
Pitman Arm-To-Relay Rod Nut	60 (81)

Pitman Shaft Adjuster Screw Lock Nut	20 (27)
Rack Piston End Plug	110 (149)
Shock Absorber-To-Frame Bolt	26 (35)
Shock Absorber-To-Relay Rod Nut	45-46 (61-62)
Side Cover Bolts	40 (54)
Steering Gear Mounting Bolts	55 (75)
Steering Pump Mounting Bolts	
2.2L	20 (27)
4.3L	36 (49)
Tie Rod Adjuster Clamp Nut	14 (19)
Tie Rod-To-Relay Rod Nut	35 (47)
Tie Rod-To-Steering Knuckle Nut	35 (47)
Union Fitting	55 (75)

1996 Chevrolet Blazer

STEERING SYSTEM - POWER RECIRCULATING BALL 1996 STEERING Power Recirculating Ball - General Motors Corp.

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